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ABSTRACT

One component of Pennsylvania's Science for the Seventies Project, an experimental science curriculum for elementary schools which makes extensive use of instructional television, was an evaluation which compared the effectiveness of the project to that of existing instructional programs. As part of the evaluation, a model was developed and implemented for administering the Television Test of Science Processes via public television broadcast to 3,500 geographically dispersed students. The tests were successfully administered, and the results suggest that the model can be used as a prototype for the administration of other examinations. This text provides background information, a review of relevant literature, a description of the model design and implementation, a summary of results, and further recommendations. (EMH)

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The Development and Implementation of a Model for Administering a Visual Test of Achievement Over Broadcast Television

A Thesis in

Academic Curriculum and Instruction

by

Robert Thomas Hill

Submitted in partial fulfillment
of the Requirements
for the Degree of

Master of Science

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CHAPTER I

INTRODUCTION

General Introduction

Television has become firmly established as a valuable tool for educators. Its uses range from something as simple and relatively inexpensive as videotaping the school football team practice on a backpack recorder with a hand-held camera to the sophisticated, complex and decidedly expensive productions broadcast over the public television network. Many academic disciplines at all educational levels have resorted to the flexibility, convenience, and impact that television can bring to the classroom.

Goodwin Chu and Wilbur Schramm (1967) in their review of instructional television research have come to this conclusion:

> For one thing, it has become clear that there is no longer any reason to raise the question whether instructional television can serve as an efficient tool of learning...the evidence is now overwhelming that it can and, under favorable circumstances, does.

Thus, those involved in exploring how television can best function as an instructional device need not be concerned with justifying its use in education. Its widespread acceptance and the scientific validation of its effectiveness have put that issue to rest. Rather, the questions now addressing teachers, instructional developers, and media specialists fall into two major categories. They are, first, how can the quality of instructional television be improved, and second, how can the uses of instructional television be expanded to improve instruction?

The lines between these two categories are not rigid and distinct, that is, improvement and expansion are interwoven. They affect each other, for an expansion without quality will not be accepted or tolerated by educators. In the same way, the quality of instructional television can be enhanced by a broadening of its applications.

This study will have its emphasis on the second category of expansion. It will be concerned with the relatively unexplored area of using television as a medium for achievement testing.

Background

The origins of this study begin with the "Science for the Seventies" Project conducted under the supervision of the Pennsylvania Department of Education from 1968 to the present. The purpose of this project has been to design, develop, implement, and evaluate a program of elementary school science which emphasizes the more recently developed strategies for teaching science. The result has been a program of instruction entitled "Science for the Seventies" (SFTS) which makes extensive use of instructional television lessons in combination with coordinated classroom activities.

In conjunction with this project, a television test has been produced to assess the comprehension of science processes in elementary school children. There were three main reasons for the development of this test.

First, there was a general need for a way to measure the effect the SFTS instructional program had in comparison with existing

programs. The SFTS developers were emphatic in this necessity.

> With all of these resources, there will also be a means of evaluating the status of the elementary school science program in a particular school or school district. This evaluative procedure will be capable of assessing a number of different facets of the science program.
>
> A school or school district desiring assistance in improving its science program could then utilize this evaluative procedure to identify its strengths and weaknesses. This diagnosis could be used as a basis for prescribing a number of alternatives of resources which could be directed toward overcoming the deficiencies which were identified. (SFTS and Instructional Television, Phase II, Project Report, 1975, p. 2).

Second, the process approach to teaching science was emphasized in one of the objectives of the Science for the Seventies program.

> Following the broadcasting of SFTS oriented televised lessons, children in participating classrooms will exhibit a measurable significant increase in their facility in the use of science processes. (SFTS and Instructional Television, Phase I, Project Report, 1973, p. 21).

Third, since the major medium of SFTS was instructional television it was a natural course of action that the instrument used to evaluate the ability of SFTS students to demonstrate their understanding of science processes be presented over television. Thus, early in the project it was decided that:

> A televised test will reveal increased student competency in the use of science processes and attainment of aims and objectives of SFTS. (SFTS Phase I, Final Report, 1975, p. 24).

The test, entitled the Television Test of Science Processes (TTSP), has been developed by David R. Torrence from the Test of Science Processes by Robert Sher Tannenbaum. Tannebaum's original

test has ninety-six items and was developed in 1968. It is administered in a multi-media format. A 35mm color slide stimulus is shown which contains a realistic representation of objects, a table of data, or a graph. In the test booklet, the visual is reproduced in black-and-white above the appropriate multiple-choice question. Students respond to the interrelated visual displays and question and then select what they believe to be the correct answer.

Torrence (1974) had several tests to choose from but decided on Tannenbaum's test because it offered several advantages.

> Of the available tests purported to measure science processes, the Test of Science Processes of Dr. Tannenbaum was chosen because it was an instrument whose statistical data showed it to be a reliable instrument possessing face or content validity. Also, the processes categorized as subsets by the author were both general and comprehensive. Most applicable to the SFTS demands was its visual presentation mode which had implication for the television format. (p. 2).

The Television Test of Science Processes as developed by Torrence is a forty item multiple-choice test administered in two half-hour sessions.

In the first half-hour, students watching the videotaped program are introduced to the test, instructed on how to fill out the answer sheet, and then answer questions 1 through 20. For each question there is a visual display, the television narrator asks the question, and the student chooses the correct answer of the appropriate multiple choice question in the test booklet, marking his answer on the answer sheet. The visual display is left on the screen

for an exposure time varying from 16 to 58 seconds which was determined by Torrence in a test-item time study. The second half-hour, covering questions 21 through 40, is conducted in the same fashion. Appendix A contains the questions and information found in the test booklet. In addition, Torrence also developed a Teacher's Manual which familiarizes teachers with the test and the concepts underlying it and gives them instructions on how to proctor the test. Appendix B contains the Teacher's Manual.

By the spring of 1975, Torrence had completed the following steps in the development of the TTSP: one, the question content of Tannenbaum's test had been subjected to a panel of recognized experts on elementary science to determine the content validity of the test as applicable to intermediate level elementary students; two, questions deemed appropriate by the experts had been rewritten so as to have a readability adequate for elementary students of the above level; three, a pilot television test and the associated print materials had been produced; four, a pilot study had been performed to ascertain the appropriate test-item exposure time; five, the videotape had been edited to conform to the time data; six, a second pilot study had been conducted which exposed the test to a larger number of students to gather data for item analysis; and seven, statistical parameters had been established which enabled the item analysis to provide a refinement of the questions comprising the final form of the test and the video production had been edited accordingly.

It is at this point that a broad exposure of the test to as large a number of students as possible is necessary, so that norms

for target populations can be ascertained. The test is scheduled to be broadcast in September of 1975 over WPSX-TV, a public television station associated with The Pennsylvania State University. The test will be broadcast during the day as part of the in-school service program.

Need for the Study

This broadcast of the Television Test of Science Processes over a public television station in September of 1975 will represent an innovative effort in education. While educators have used television as a medium for testing before, as will be discussed in Chapter II, no instance is revealed in the literature in which such a carefully developed achievement test has been publicly broadcast as part of an in-school service program to students over a large geographic area. Thus, if successful, it will set a precedent for both future administrations of the TTSP and the development and administration of other television tests.

The success of this broadcast of the TTSP depends upon close cooperation of a large number of professionals in education. It is anticipated that classroom teachers, elementary school science chairpersons, elementary school principals, school superintendents, district designates of the educational broadcast council, central management of the broadcast council, and members of the SFTS project that had developed and produced the test will all have the potential to make an important contribution to administration of the test.

Considering then both the innovative nature of the upcoming broadcast of the test and the amount of coordination necessary between the large number of those directly involved, it has been recognized that there would be a definite need for a system of procedures and guidelines to insure an administration of the TTSP free from the problems usually encountered in such a multi-level cooperative effort.

Statement of the Problem

The problem then to which this study will address itself is posed in the following question: Can a model of administrative procedures and guidelines be developed which when implemented will result in the successful administration of the Television Test of Science Processes?

Significance of the Study

The development and implementation of this model, if it results in a successful administration of the TTSP, will be significant for three reasons: first, if this prototype is validated, it will set an administrative precedent for both future broadcasts of the TTSP and the development and administration of other television tests of this type; second, it will provide Torrence with the data needed to derive norms for target populations; and third, the students participating in this administration of the test can be retested at a later date for comparison purposes.

Definition of Terms

The following terms are defined so as to provide the reader with their precise meaning in the context of this study.

Achievement test -- An achievement test is an instrument designed to measure information acquired by an individual from a program or programs of instruction.

Broadcast television -- Broadcast television is the unrestricted transmission over open air of a television signal which can be received by any standard television monitor. It is contrasted with closed-circuit television on which reception of the signal is limited to monitors directly connected to the transmitting agency by microwave or cable link.

Instructional television -- Instructional television is a television program or a series of television programs, the purpose of which is to educate or instruct rather than entertain.

Television test -- A television test is a visual test presented by use of television as a delivery medium.

Test administration via television -- Test administration via television is the administration of a verbal test using television to explain test procedures and, in some cases, actually present the printed test questions.

Verbal test -- A verbal test is an instrument of evaluation which assesses primarily by means of information presented in a verbal or print format.

Visual test -- A visual test is an instrument of evaluation which assesses primarily by means of information presented in a visual or pictorial format.

Summary

As instructional television has become firmly entrenched in the American educational structure, its uses have expanded greatly. This study will concentrate on one of these expansions, namely test administration using broadcast television as a medium. Specifically, it will be concerned with the development and implementation of a model for administering the Television Test of Science Processes to a large population of elementary school students geographically dispersed throughout central Pennsylvania.

CHAPTER II

REVIEW OF THE LITERATURE

Method

Due to the innovative nature of television testing, it was felt that research on the topic would be sparse and scattered throughout the numerous journals and publications in the field of education. With this in mind, a computer search of both Psychological Abstracts and ERIC was performed using the descriptors television and testing. While this method produced many "hits" not directly related to the topic of television used as a testing medium, the following studies proved to be of relevance. They can be grouped into three basic categories, namely, visual testing, test administration via television and testing by television.

Visual Testing

Gross (1969) argues persuasively for more testing of students by visual media. She points out that in recent years there has been more and more emphasis on student learning by visual presentation but tests have remained locked in print. She concludes that it is unfair to the student to test verbally what he has learned visually.

> The verbal testing of visually presented material is often frustrating to the student and is not a true measure of what he actually knows. In this way, this verbal testing in the presence of visual presentation stimuli is akin to the older IQ tests which are not a measure of general intelligence but largely a measure of white middle-class vocabulary standards. (p. 35).

The wave of research in instructional film and television in the 1950's brought a pioneer attempt in visual testing. Carpenter, Greenhill and others (1954) developed a motion picture test for the Track Vehicle Repairman Course at the U. S. Amry Ordnance School. It presented a series of situations which showed a malfunction, an incorrect mechanical procedure, or a parts identification or relationship problem. After piloting the test with 316 students, high reliability was demonstrated and they concluded that:

> Film tests can be practical to administer, objectively scored, and make it possible to test areas of performance not amendable to paper pencil testing. (p. 521).

Another use to which film tests have been put is in psychometrics (Seibert and Snow, 1965; Seibert, 1970). Among the psychological film tests developed are visual tests of long and short term memory and various tests of the principles underlying visual perception.

Curtis and Kropp (1961, 1962) conducted an extensive series of exploratory research in visual testing using slides. Intelligence, achievement, vocational interest, and adjustment tests were all presented in the visual projection mode. Variables tested included intra-item exposure interval, inter-item exposure interval, items per exposure, audio-visual and visual item presentation, and item difficulty arrangement. These studies were done with an eye toward television testing, but the cost factor prevented any research in that medium.

Among their more important conclusions was that this type of visual testing was more "feasible for the administration of tests

of cognitive abilities" than for test of attitudes such as vocational interest. (1961, p. 79). They also noted that:

> The projected mode of test administration can yield a greater coverage of test content in a unit of time than can the normal mode of test presentation. It would seem that for cognitive tests, test-taking time can be reduced without sacrifice of mean, variance, reliability or validity. (1961, p. 79).

Another interesting finding concerned the value of the students seeing all the items on a test in a once-only type of exposure.

> The projected mode of administration increases the number of items which Ss attempt. Although this would be expected on the basis of exposing all items to Ss, there seems to be an additional advantage in that the procedure weakens the 'cautiousness' response set of some Ss, perhaps because Ss know that an item will be presented one, and only one, time and it prevents persevering on difficult items which appear early in the test. (1961, p. 80).

Stoker, Kropp, and Bagshaw (1968) reported no significant difference between a booklet version and a projected slide version of the Occupational Interest Inventory Test. In an interesting reversal of this type of research, Hoffer (1972) found that the ability to trouble shoot television receivers could be as effectively tested by using photographs of the screen as it could be actually using the television itself.

Test Administration Via Television

The first uses to which television was put in education was to simply transmit lectures from a classroom or studio. Similarly, the first uses of television in the realm of educational testing was simply as a delivery medium.

Woodward (1964) and Pensinger (1969) describe one such system which had been in use at San Jose State College since 1959. When standardized tests, such as the Graduate Record Exam, were to be administered, only one person knowledgeable in the procedures of the test was required. This person would describe how the test would be conducted, tell how to fill out the answer sheet and give any other instructions from the campus television studio. These instructions would be broadcast into several classrooms containing approximately thirty students and a proctor. The classrooms were linked to the studio by a telephone line. While the students were taking the exam, a clock showing how much time was remaining would be broadcast over the system.

Woodward strongly emphasizes the advantage of such a system.

> In conclusion, television testing offers a very real solution to the problems of testing large groups with standardized examinations. Problems associated with large-group testing are virtually eliminated. Fewer directions are misinterpreted by the students; complete standardization is achieved; a smaller additional professional staff is required for testing. (1964, p. 138).

Diamond (1968) in his review of instructional television also strongly favors this method. He points out that:

> By utilizing an enlarged testing form, student errors in filling out the required information can be substantially reduced, at a savings of hundreds of man-hours required for hand scoring. In addition, complete standardization is obtainable at the University of Miami, the first time this approach was applied, student error in completing the required information -- student ID, seat, and section number -- was reduced by 80 percent. (1968, p. 383).

Hopkins, Lefever, and Hopkins (1967) compared administration of the Metropolitan Science Test by either closed-circuit television or teacher. These subjects were 3,375 fifth and sixth grade students in twenty elementary schools.

The results showed no overall significant difference in means for either type of administration. However, it is of interest to this study that those students in large classes (approximately 70 students) scored significantly better with TV administration of the test.

A logical extension of this use of television for testing is reported by Dambrot (1972) in her review of presenting psychology courses over closed-circuit television at the University of Akron. She describes a system by which the printed questions, themselves, were broadcast.

> Multiple choice items are typed on 5"x8" green note cards using an IBM Selectric typewriter with orator type. Questions are carefully edited to fit a 3"x4" margin on the note card. In a television test, these test items on the cards are projected over the TV receivers. Each item is shown for 40 seconds and read by the TV lecturer. At the end of the test each item is visually shown again for 20 seconds. This second projection gives the student an opportunity to check or change his answers. Test questions are not read by the TV lecturer on the second projection. Then the answer sheets are collected and the test items projected for the third time with the correct answers provided. This third projection gives immediate feedback and reinforcement to the students. In a 50-minute period, a total of 30 multiple-choice items are projected three times. (1972, pp. 186-187).

Dambrot reported that, initially, students in the course reacted quite negatively to this type of test. After some modifications,

among them reducing the number of test items and improving the quality of the graphics and video, the student attitude improved to the point where 76 percent of the students were satisfied with this method of testing.

Two studies have shown the classroom teacher to be a significantly better test administrator. Munger (1972) had the Gates Reading Survey test administered over closed-circuit television and by classroom teachers. She found higher reading scores for the students in the latter group. Hegstrom and Phillips (1973) used both a television narrator and classroom teachers to administer two specially prepared tests of reading assessment. They also found a significant difference in favor of the classroom teacher. This suggests the possibility that tests of reading ability do not adapt well to administration over television.

Testing by Television

Testing by television is a hybrid of visual testing and test administration via television. The medium is used not only as a delivery mechanism but also as an integral part of the testing process.

While not truly academic tests, two relatively well-known early examples of this type of testing were the National Driver's Test presented by CBS-TV in the middle 1960's and the National Citizenship Test. The format was typical for tests of this genre -- a short scene or demonstration was shown and then questions were asked concerning it. Alper and Leidy (1969) found that persons who had

viewed the National Citizenship Test performed significantly better than non-viewers on a true-false questionnaire covering the information presented on the test both one month and six months after the test.

Fargo, et al., (1967) administered the Peabody Picture Vocabulary Test (PPVT) by television. The parallels between the PPVT and the Television Test of Science Processes are striking. Both are achievement tests for elementary school children which began as visual tests administered individually by projected slides and then were adapted for presentation over television. Therefore, it is particularly interesting to note that when the PPVT was administered to third and fifth grade children at the University of Hawaii Elementary School, no significant difference was found between an administration to a group by television and a one-on-one teacher to pupil administration.

The researchers also pointed out that the TV test had several advantages. It was more economical in time and personnel (2 1/2 man-hours per student using TV, 25 man-hours using individual administration). TV could make the test more uniform, and thus more consistent and reliable, by using one narrator/test administrator, and also by repeating the same videotape at different times and in different schools. Also classes would not be interrupted for individual administrations.

Two other studies have compared a television test with the former mode of administration. Graham (1971) describes how a diagnostic test in electronics making extensive use of schematics and

diagrams was converted from a five-screen slide presentation (one each for the stem and four alternatives) to a television test. No significant difference in scores was found between these methods of presentation. As the author points out, the five-screen slide version had the advantage of being able to display the stem and alternates simultaneously, but the television test was much easier to distribute and administer.

Stallings (1972) compared television and audio presentations of the MLA French Listening Examination. Once again, there was no significant difference in test scores. The advantage here would be with the television test as a source of non-verbal cues from the speaker.

Another use of television testing of second-language skills is described by Thomas (1975). It is a purely visual test. The television screen is divided into quadrants, each presenting a slightly different drawing. These drawings are also reproduced in the test booklet. A sentence is read in the second language and the student places a checkmark in the corner of the picture that depicts the sentence best.

A bit of informal research was carried out during the administration of this test when there was a power loss in several classrooms and the sentences had to be read orally by the test proctors. Analysis of these test scores showed there was no significant difference between these and the classrooms that had received the TV test.

Taggart and Moore (1972) report on an interesting use of television testing in the language laboratory. Students watched a series of videotaped situations played on a television monitor, heard the language being spoken over headsets, and then responded orally to questions on the scene using a cassette recorder. At the end of the test, the audio cassettes were collected and graded. Each test was 30 minutes long and contained three situations and a total of 50 questions.

The situational type of testing popularized by CBS has also been used by other educators. Project NuTEx (Landis, Masonis, and Loye, 1971; Masonis, 1971) attempted to improve the National Teacher Examinations by creating two television tests. The first was a multiple-choice verbal test. It was found to be statistically invalid.

The second test displayed various classroom situations and asked questions on each. Unfortunately, while the construction of this test was covered extensively, no report was made on whether or not it was piloted.

Examples of situational testing can be found in industrial training and medical education. Ford Motor Company (Deimel, 1975; Sundt, 1975) makes use of it in their sales training videocassettes. A situation involving a salesman and a customer is displayed and then the viewers are quizzed on the appropriateness of the salesman's actions. These programs are reported as having been quite well received at the dealerships.

The Network for Continuing Medical Education (NCME), supported by a drug company, distributes videocassettes to doctors for a fee. These bi-weekly programs provide updates on medical information. One method they use is informational and situational "self-assessment" quizzes in each videotape to increase "physician involvement" (Jacobson, 1975). The NCME has also produced the "National Antibiotic Therapy Test" and distributed it to 370 hospitals and medical schools. For each question on the test a clinical situation is presented and then a choice of four drugs is given. There is a pause for the doctor viewing the videotape to make a response, then a panel of experts discuss the pros and cons to each answer. Educational and Industrial Television (1976) reports that over 30,000 physicians have taken the test in the past two years.

Summary

Most importantly a review of the above studies shows that television testing has great potential for educational evaluation. When constructed with care it is as effective as normal classroom administration of verbal testing and it offers several advantages implicit in the medium.

First, it can expand the quality and scope of current test capabilities by adding visual elements to the test. The need for visual testing is becoming more apparent as our culture becomes more visually oriented. In addition, television testing can present situational elements which make the test a much more sensitive instrument to assessing the judgmental abilities of its audience.

Second, a television test recorded on videotape is inherently a standardized test. It can have repeated exposure with no variation in items, presentation method, and pacing.

Finally, a television test can be extremely cost effective as several of the studies have demonstrated. There can be a considerable decrease in the man-hours required for administering and proctoring the test. As a result, a test can be exposed to a larger student population with the same number of professional staff.

The studies did not offer much insight into the development of a procedural model for the administration of the Television Test of Science Processes, however, simply because no study had developed any such procedures which could be applied to the upcoming broadcast. In addition, most of the studies had been conducted with populations of under 500 subjects, while the TTSP had the promise of a much larger group. Thus, it was apparent, that the model developed and implemented for the TTSP would, if the results were successful, have decided value for future administrations of the TTSP and other tests administered over broadcast television.

CHAPTER III

PROCEDURES AND DESIGN

Introduction

The problem of this study as defined in Chapter I, was to design a procedural model for the administration of a visual test over broadcast television which, when implemented, would result in a successful administration of the Television Test of Science Processes. The TTSP was scheduled for broadcast over WPSX-TV, a public television station in September of 1975. Since a review of the literature produced no information or guidelines on the administration of this type of test, it was realized that the model would have to be developed from a detailed analysis of the problem and would have implications not only for this first broadcast of the TTSP, but also for future administrations of this test and other television tests. What follows then is the analysis of the problem, the development of the model, and the design for the implementation of the model to the upcoming broadcast of the TTSP.

Analysis of the Problem

The TTSP is a standardized achievement test which has been scheduled to be administered over broadcast television to a potentially large population of intermediate level elementary school students in September of 1975 to assess their knowledge of science processes. The first step in the analysis of the problem is to

divide it into sub-problems which are identified by posing the following questions.

1. How can the elementary schools within the broadcast range of the television station be informed of the upcoming broadcast and encouraged to participate?
2. How can those elementary schools that desire to participate be identified?
3. How can the test materials, that is, the test booklets, answer sheets, and teacher's manuals, be distributed to the appropriate schools?
4. What methods and procedures would be necessary to insure that the individual classroom teachers are knowledgeable in the proper manner of filling out the answer sheets and other proctoring information?
5. How can the test materials be returned to the administering agency?
6. How can the answer sheets be scored and the results interpreted for and distributed to the participants?
7. What methods can be developed to evaluate the procedural model developed for all of the above?

Taking these questions into consideration, the next step in the analysis is to build a viable framework to seek solutions to the sub-problems they represent. An examination of the issues raised by these sub-problems yields three distinct areas of interest.

The first area that must be considered is the identification of those institutions which will take part in the administration of the

test. Those whom the test administrators think would be interested in participating have to be informed of the upcoming event, they have to be motivated so they will want to take part, and those which indicate a willingness to participate have to be identified.

The second area is a matter of logistics. The test and associated materials have to be distributed to the participating institutions, special instructions have to be given to those serving as classroom proctors and administrators of the test, the test is then administered, and all test materials have to be collected and returned to the administering agency.

The last area is concerned with evaluation. The tests must be scored and the results interpreted. These results with the appropriate interpretations must be distributed to those who took part. Finally, the administration of the test itself has to be evaluated to identify procedural flaws or poor administration practices that must be corrected.

By isolating the various sub-problems into one of the three areas of identification, logistics, or evaluation, it now becomes possible to begin the development of the model of procedures for the administration of a visual test over broadcast television.

Development of the Model

The model developed to administer the TTSP is depicted in Figure 1. Its purpose is to provide the outline of a system of procedures that, if adhered to, will result in the successful administration of

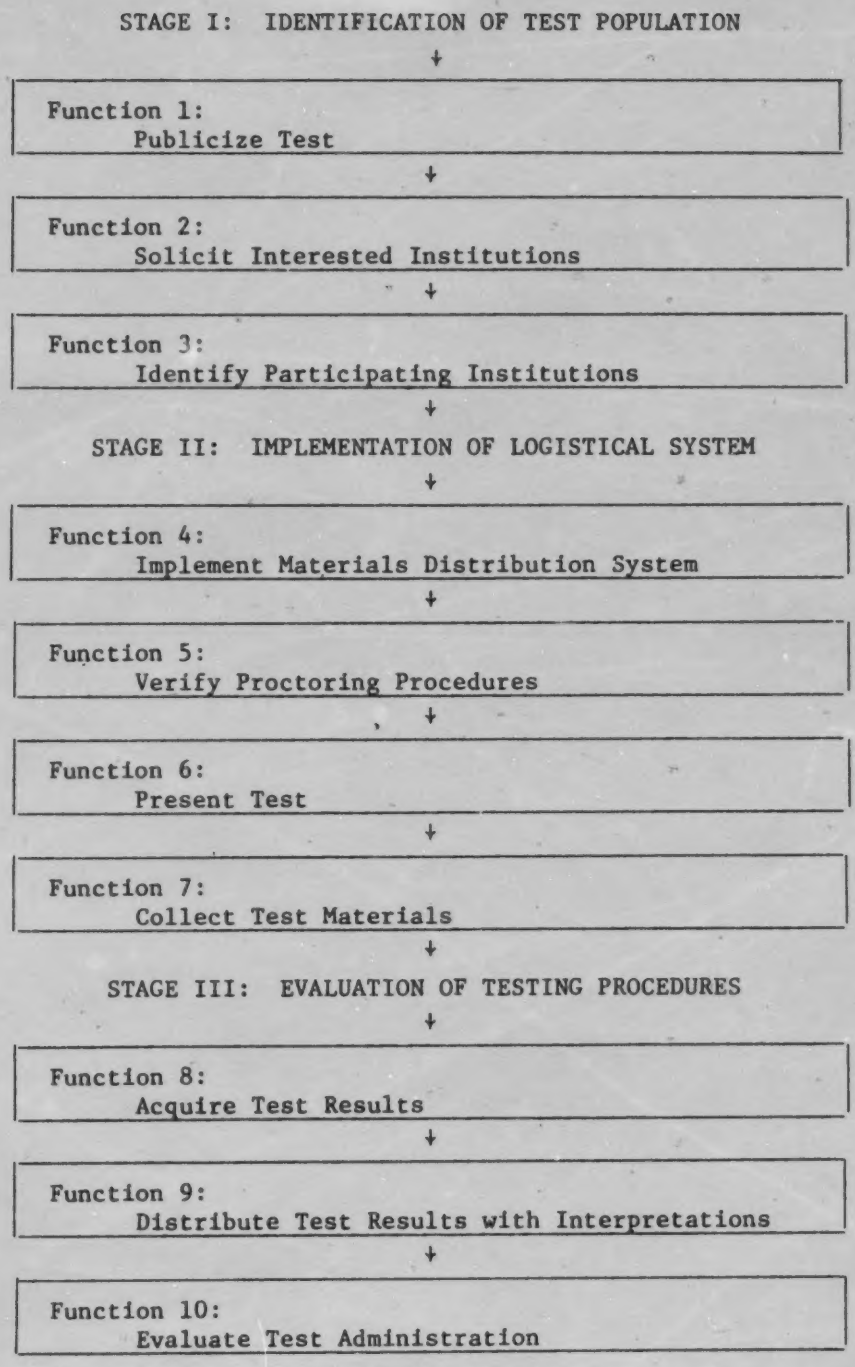

Figure 1: Model for the Administration of a Visual Test of Achievement Using Broadcast Television as a Delivery Medium

a visual test using broadcast television as a delivery medium. Both its stages and functions correspond closely to the areas identified in the analysis of the problem. Each stage will now be discussed in light of the particular requirements of the TTSP.

The first stage, identification of the test population, would be critical to the success of the project. Essentially, the elementary school administrators and teachers are going to be approached with a test they have not been exposed to before and, in addition, a test which is to be presented by broadcast television. Due to these innovative aspects, the information publicizing the upcoming broadcast of the test and the methods used to invite the participation of the various elementary schools will have to be designed for maximum effectiveness. This will result in a test population large enough to derive norms for target populations as required by Torrence.

Design for Implementation of the Model to the Administration of the TTSP

The next step in the procedural design is to take the model derived from the analysis of the problem and apply it to the development of specific procedures for the administration of the TTSP. The specific procedures derived from each stage and function of the model will now be examined.

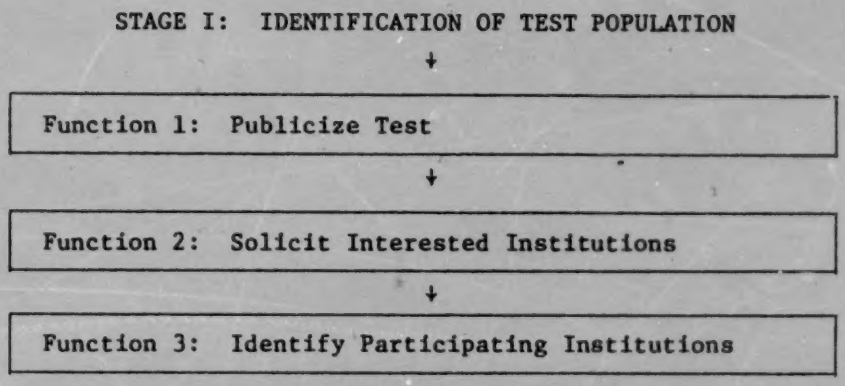
STAGE I: IDENTIFICATION OF TEST POPULATION
Function 1: Publicize Test
Function 2: Solicit Interested Institutions
Function 3: Identify Participating Institutions

Figure 2: The Model, Stage I

Stage I: Identification of Test Population

During his pilot research described in Chapter I, Torrence had established readability of the TTSP at a fourth-grade level. On this basis, it has been decided that the projected test population should be fifth-grade students. Since it would be early in the school year, they should have the reading skills adequate for the comprehension of test questions.

What needs to be done, then, is to publicize the test to the elementary schools within the broadcast range of WPSX-TV, invite and encourage their participation, and provide a means for identification of those willing to participate.

About seventy percent of those schools are members of the Allegheny Educational Broadcast Council (AEBC). The AEBC is an instructional television school service agency which has as its main function the acquisition and broadcast of instructional television programs for classroom use. There would be several advantages in working cooperatively with AEBC during the implementation of Stage I.

First, as mentioned above, the majority of schools in the WPSX-TV viewing area are members. Thus, by working through the agency, a significant number of the area schools can be reached.

Second, WPSX-TV has been allotting time for the broadcast of programs acquired by AEBC. Thus, AEBC has a working relationship with both the station broadcasting the TTSP and the schools that are potential participants.

Third, AEBC has been presenting the "Science for the Seventies" television lessons. Thus, the member schools are already acquainted with the parent project and, as a result, would probably be receptive to the TTSP.

Finally, each member school district or school appoints an AEBC District Designate, usually a teacher. The designate functions as a liason between AEBC and the school district or school. Thus, this person could serve as a coordinator for the TTSP at the school level.

With all these factors taken into consideration, it is concluded that the implementation of the model can be greatly facilitated by working with AEBC. With this in mind, the following procedures are specified.

Function 1: Publicize Test. The Executive Secretary of AEBC should contact each member school district or school by letter. This letter will publicize the test by giving the dates and times that the test will be broadcast. Another channel is the AEBC Utilization Conference which will be

held on August 26. Since most District Designates will be in attendance, a presentation should be made to further publicize the test. In addition, this presentation can reiterate and reinforce the information contained in the introductory letter and provide the designates with the opportunity to see portions of the test and ask any questions.

Function 2: Solicit Interested Institutions. Once again, the letter from the Executive Secretary and the presentation at the Utilization Conference can solicit participation by explaining the background and rationale of the test and by delineating the benefits of taking part.

Function 3: Identify Participating Institutions. The letter from the Executive Secretary can also identify those willing to participate by giving instructions on how to obtain test materials by a cut-off-date.

Stage II: Implementation of Logistical System

A methodical system has to be created to distribute the test booklets, answer sheets, and teacher's manuals to the participating schools identified in Stage I. The classroom teachers have to be informed of all proctoring procedures, and, after the test has been

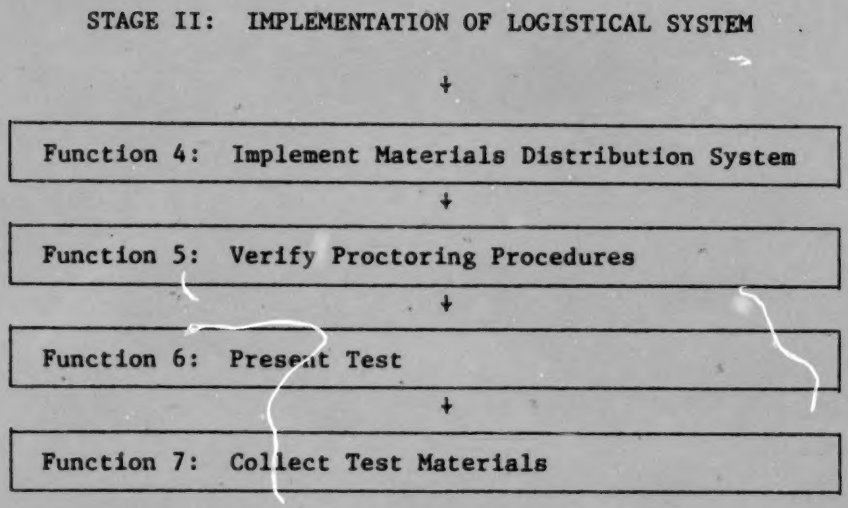
STAGE II: IMPLEMENTATION OF LOGISTICAL SYSTEM
Function 4: Implement Materials Distribution System
Function 5: Verify Proctoring Procedures
Function 6: Present Test
Function 7: Collect Test Materials

Figure 3: The Model, Stage II

taken, all test materials have to be returned. In keeping with the principles of simplicity and efficiency underlying the development of this stage, the following procedures have been devised.

Function 4: Implement Materials Distribution System. When the schools registered with AEBC to take the TTSP, they could at the same time request the approximate number of printed test materials that they require. Once the cut-off-date is reached, registration for the test will be closed, a master list compiled, and the printed materials will be mailed to the appropriate school districts which will have the responsibility for distribution to the individual schools. If an individual school is participating, they would receive the materials directly. Contact

by telephone will be made to insure that the materials have been received.

Function 5: Verify Proctoring Procedures. General details on taking the test and filling out the answer sheet are covered during the opening moments of Part I of the test and in the Teacher's Test Manual developed by Torrence (Appendix B), which will be among the materials mailed. However, more specific instructions will be necessary. The students' names have to be penciled in on the answer sheet so it can be returned to them for Part II of the test and the name of the school district has to be placed there also in case any of the answer sheets are mixed up before they can be scored. These additional instructions can be given during the telephone check of materials received.

Function 6: Present Test. Because some schools wishing to participate might not be able to take the test on the scheduled broadcast dates, it should be acceptable if they videotape the test for administration at a later time. Only two conditions should be imposed -- they will have to provide the videotape on their own equipment and they will have to administer the test and return the other test materials by a cut-off date. It is anticipated

that this option should not yield any important differences between those who chose to videotape for a later playback and those taking the test when broadcast.

Function 7: Collect Test Materials. The printed test materials can be mailed back to AEBC after the test's administration. The answer sheets should be separated from the other materials for scoring.

STAGE III: EVALUATION OF TESTING PROCEDURES

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Function 8: Acquire Test Results

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Function 9: Distribute Test Results with Interpretations

↓

Function 10: Evaluate Test Administration

Figure 4: The Model, Stage III

Stage III: Evaluation of Testing Procedures

The third stage of the model presents some easy decisions and some difficult ones. The difficulties exist because the return of test scores to the participating institutions will be a sensitive matter and must be handled delicately. The TTSP has never been exposed to a group of the size that is anticipated, norms have not been established; and, thus, the opportunities for misinterpretation of the results may be great. It would be unfortunate if further development

of the TTSP is hampered by a misunderstanding of test results by one or more participants. These factors have led to the adoption of the following procedures.

Function 8: Acquire Test Results. The answer sheets will be coded and scored by Examination Services, University Division of Instructional Services, The Pennsylvania State University. The SFTS project has used this service in the past with satisfaction.

Function 9: Distribute Test Results with Interpretations. For purposes of this pilot large-scale broadcast, the only results sought will be the overall mean for the entire test population and the mean for each school district or school. If any school district or school wishes to break down the results any further they will be supplied with their own answer sheets and a test key, so that they will be able to determine individual results if they wish. These results -- overall mean and school district mean -- will be made known only to each individual participating school district or school, that is, no other participant would be told what another school district or school has scored. Also, all test results will be provided with the appropriate interpretations. Misinterpreted results would be worse than no results at all.

Function 10: Evaluate Test Administration. To assess the impact and value of this first large-scale administration of the TTSP, a follow-up questionnaire will be designed and mailed out after the test has been given to the classroom teachers participating in the administration. It will not only indicate the affective responses of the teachers, but also provide data on such information as size of classes, whether the television receiver was color or monochrome, the quality of the reception and so on. The results of this questionnaire shall be combined with the impressions of the project planners and others to evaluate the project's successes and failures.

Summary

A review of the literature produced no useable guidelines for the problem addressed by the study, namely the development of a procedural model for the administration of a visual test over broadcast television and the implementation of this model to the administration of the Television Test of Science Processes. In this chapter, then, an analysis of the problem was performed; from this analysis a model was developed, and this model was applied to the TTSP which resulted in the development of specific procedures for implementation.

CHAPTER IV

RESULTS OF THE IMPLEMENTATION OF THE MODEL

Introduction

The problem investigated by this study was the development of a procedural model for the administration of a visual test over broadcast television and the implementation of this model for the administration of the Television Test of Science Processes. A review of the literature produced no administrative guidelines of value, so an analysis of the problem was undertaken and from it a model was developed. This model was then applied to the upcoming broadcast of the TTSP and specific procedures were derived from it. This chapter will describe in detail the implementation of the procedures and what occurred as a result, using the stages and functions of the model as an outline for discussion.

Stage I: Identification of Test Population

Function 1: Publicize Test

Publicity for the test was first generated by a letter. This was written by Mr. William Barnhart of AEBC, dated August 14, 1975, and addressed to superintendents of member school districts and district designates (Appendix C). In addition, a presentation was made to the district delegates during the AEBC Utilization Conference at University Park, Pennsylvania on August 26. Both of these activities were also utilized for Function 2.

Function 2: Solicit Interested Institutions

Barnhart's letter also solicited participation by explaining the procedures of the test, the reasons behind it, and how each school would benefit from taking part. He referred any questions that school officials might have to the upcoming AEBC Utilization Conference.

The presentation at this conference on the TTSP encouraged participation in the following manner. The information contained in the Barnhart letter was summarized, the opening moments from Part I of the TTSP were shown along with the test booklet and teacher's manual, and questions from the floor were answered. One concern expressed as whether it would make a difference if the test were viewed in color or monochrome. It was explained that the test and the visuals for it had been designed with this in mind and that it shouldn't make any difference. Other questions also concerned the development of the TTSP itself. Some delegates wanted figures on reliability and validity which were unavailable at that time. Others expressed the opinion that the TTSP was at a reading level above fifth grade. With the latter in mind, some of the delegates wanted to know why the classroom teachers ccouldn't read the alternative answers to their students during the test.

All questions were answered making use of available information. While some delegates seemed to be dissatisfied with the replies they had received, the majority expressed interest in the upcoming event and several delegates confirmed that their school districts would participate in the test.

The final method used to solicit interested instructions was personal contact, either by staff members of AEBC or the SFTS Project. In several instances this proved to be a most influential factor in an institution's decision to take part.

Function 3: Identify Participating Institutions

Institutions evidenced their desire to participate by requesting test materials. Instructions on how to do this were included in the Barnhart letter and reiterated at the conference presentation.

Between late August and September 8, which was established as the cut-off date for request, fourteen school districts indicated that they would participate in the test. An additional two public schools and three parochial schools also indicated their willingness to participate. Table 1 contains a list of the school districts and individual schools that took part in the TTSP project, the number of tests requested and the number of tests scored. Figure 5 shows the geographical distribution of the school districts and individual schools throughout central Pennsylvania.

Stage II: Implementation of Logistical System

Function 4: Implement Materials Distribution System

The various school districts or individual schools requested materials by contacting AEBC either by letter or telephone. These requests were forwarded to a staff member of the SFTS Project who then compiled a master list for distribution of materials which were

then mailed. This proved to be a source of difficulties, especially if the requests were made informally or by telephone. In three instances, due to delays in either receiving or forwarding these requests, the test materials would not have been received in time if mailed, and had to be brought to the appropriate schools by car.

Teacher's manuals were distributed as requested, or if no specific number was supplied, in the ratio of one manual for every twenty test booklets and answer sheets. Each package sent out to the schools, then, contained the number of test booklets and answer sheets that had been requested and the appropriate number of teacher's manuals.

Function 5: Verify Proctoring Procedures

A telephone check was made shortly before the broadcast of the TTSP with each school district or individual school to insure that the test materials had been received. In addition, special instructions were given and any questions about the proctering process were answered.

These telephone calls proved to be troublesome and time-consuming. Elementary school teachers and administrators can be very difficult to reach by telephone during the school day and leaving a message does not insure that the proper information will be received.

Function 6: Present Test

The test itself was broadcast twice during the third week in September according to the following schedule:

TABLE 1

SCHOOL DISTRICTS AND SCHOOLS PARTICIPATING IN THE TTSP

Name and Location	Number of Answer Sheets Requested	Number of Answer Sheets Scored
Altoona Area School District Altoona, PA 16603	900	750
Bald Eagle Area School District Wingate, PA 16880	266	245
Bellefonte Area School District Bellefonte, PA 15823	280	233
Berlin Brothersvalley Area School District Berlin, PA 15530	81	74
Brookville Area School District Brookville, PA 15823	220	190
Clarion-Limestone Area School District Strattanville, PA 16258	125	82
Curwensville Area School District Curwensville, PA 16833	145	138
Indiana Area School District Indiana, PA 15701	355	318
Lock Haven Catholic School Lock Haven, PA 17745	25	21
Northern Bedford Area School District Hopewell, PA 16650	115	104
Punxsutawney Area School District Punxsutawney, PA 15767	150	133
St. Francis School Clearfield, PA 16830	22	21
St. Peter's School Somerset, PA 15501	29	25
Shade Central City Schools Cairnbrook, PA 15924	85	83

TABLE 1 (cont'd.)

Name and Location	Number of Answer Sheets Requested	Number of Answer Sheets Scored
Spring Cove Elementary School Roaring Spring, PA 16673	155	149
Union Area School District Sligo, PA 16255	100	82
Warren County School District Warren, PA 16365	650	450
Westmont Hilltop Area School District Johnstown, PA 15905	280	172
Williamsport Area School District Williamsport, PA 17701	240	209

Part I -- 9:30 a.m., September 16
Part II -- 9:30 a.m., September 17

Part I -- 2:00 p.m., September 18
Part II -- 2:00 p.m., September 19

Approximately three-quarters of the participants took the test on these dates. The remaining quarter videotaped the test and took it at a later date with the understanding that all test materials had to be returned to AEBC for scoring by November 15.

Function 7: Collect Test Materials

Each school district or individual school was responsible for mailing the completed answer sheets, test booklets, and teacher's

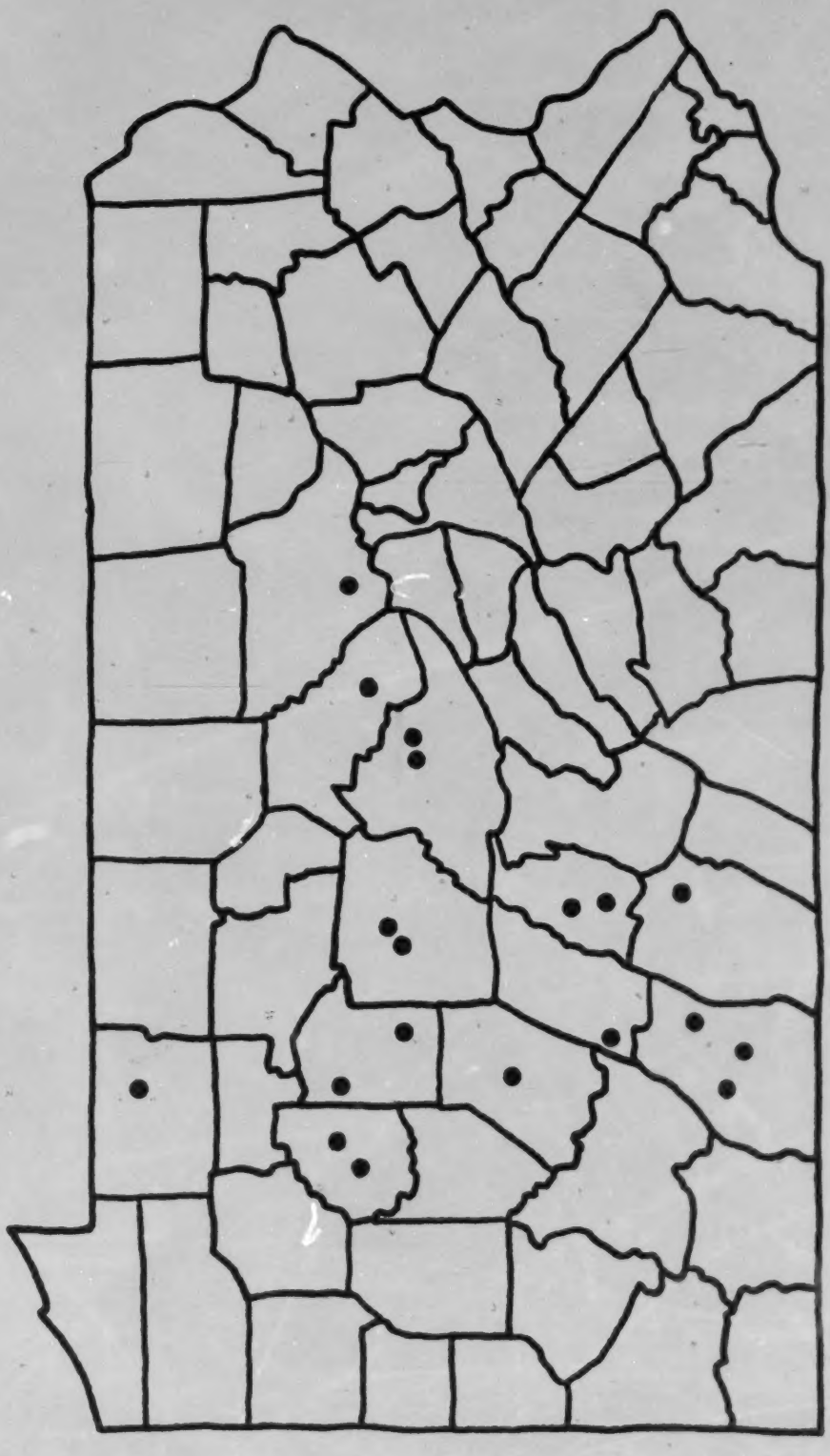

Figure 5: Geographical Distribution of Participating School Districts and Schools

manuals back to AEBC. All of the test materials distributed were received by the cut-off date.

Stage III: Evaluation of Testing Procedures

Function 8: Acquire Test Results

Of the approximately 4200 answer sheets distributed, over 3500 were completed by students and received back for scoring. Approximately 50 had to be discarded because the student had not been able to take one part of the test due to absence. Some schools had not received enough answer sheets, so they had used photocopies for several groups of students. As a result, it was necessary to transfer each student's answers to an original answer sheet.

The answer sheets were sorted and then brought to Examination Services, University Division of Instructional Services, at The Pennsylvania State University for coding and scoring. As planned, an overall mean and a mean for each school district or school was obtained. The total number of answer sheets scored was 3,479.

Function 9: Distribute Test Results with Interpretations

Since Mr. David Torrence had developed the TTSP, it was decided that he should have the major role in distributing the test scores with the accompanying interpretations. He sent to each school district or individual school a letter requesting further information which would aid him in determining target population norms (Appendix D). In this letter, he also explained his responsibility in making the test

results and the appropriate interpretations available to them. After receiving their replies and establishing the necessary norms, he reported to each individual participant the appropriate scores with interpretations.

Function 10: Evaluate Test Administration

Approximately two weeks after the broadcast of the TTSP, copies of the "Teacher's Survey", which contained 13 multiple choice questions, were sent out to those serving as test coordinators in each school district or school for distribution to the classroom teachers. The number of questionnaires sent out was determined by the number of teacher's manuals which had been requested. With each was a cover letter explaining the purpose of the survey and a stamped self-addressed envelope.

In total, 165 surveys were sent. Of these approximately 20 were returned blank because the number of classroom teachers who had participated had been overestimated. The total number of surveys returned for tabulating was 115 which is almost 80 percent of the adjusted total. This high rate of return reflects quite positively on the strong interest the participating classroom teachers had for the TTSP. This interest was also reflected in the written comments which had been requested at the end of the survey.

Table 2 contains the "Teacher's Survey" and the tabulated results. To the left of the actual questionnaire are two columns of figures. The digits in the first column marked "N" are the number

of responses made for the choice located to the right of it on the same line. The second column represents the individual numbers as a percentage of the entire response to the question. In addition to these figures based on the multiple choice responses, many revealing and worthwhile comments were also received. An analysis of both yields several insights into the project.

First and most important was the problem of television reception which was not conducive to good performance on the test. Note the responses to questions four and six. Nineteen percent of those responding considered the video reception inadequate and 30 percent indicated that technical difficulties were present throughout the test. The disturbing conclusion is that one child in five took the test in substandard conditions. The written responses also reflect this. These problems occurred during both the open-air broadcast and the videotaped playbacks and were blamed on either poor reception or incorrect sizing of the screen on the television monitor. The following comments reflect this:

> The reception of WPSX-TV at our school is very poor. This is both audio and visual. Several times during both sessions the picture and sound would fade out for approximately five or more seconds...If it had not been for the poor reception, I would welcome having the test televised again...

> The test will not be a fair evaluation of my class because of the terrible technical trouble we experienced...The television set we must use is a 19 inch portable, black and white and the reception was very poor...

TABLE 2

TABULATED RESULTS OF TEACHER'S SURVEY
TELEVISION TEST OF SCIENCE PROCESSES

N	%	
		1. What was the size of the class taking the test?
1	1	a. Under 15
94	81	b. 15-30
17	15	c. 30-45
1	1	d. 45-60
2	2	e. More than 60
		2. Was the test taken when broadcast by WPSX (September 16, 17, 18, 19) or videotaped and taken later?
85	74	a. Taken on the broadcast dates
30	26	b. Videotaped and taken later
		3. Was the television monitor, that the students viewed the test on, color or monochrome (black and white)?
12	10	a. Color
103	90	b. Monochrome
		4. What was the quality of the television picture throughout the test?
18	16	a. Very good
28	24	b. Good
47	41	c. Adequate
22	19	d. Inadequate
		5. What was the quality of the television sound throughout the test?
34	30	a. Very good
36	31	b. Good
32	28	c. Adequate
13	11	d. Inadequate

TABLE 2 (cont'd.)

N	%	
		6. Technical difficulties during the televised presentation of the test
72	64	a. Were non-existent or inconsequential
18	16	b. Were remedied in the first few minutes
22	20	c. Were not remedied in the first few minutes, but did not result in cancellation of the test
0	0	d. Resulted in the cancellation of the test
		7. Did you receive a teacher's manual giving guidelines on how to administer the test?
105	91	a. Yes
10	9	b. No
		8. The orientation to the test that I received in the teacher's manual was
9	9	a. Extremely effective
79	76	b. Generally adequate
12	12	c. Marginally adequate
3	3	d. Generally inadequate
0	0	e. Extremely ineffective
		9. The information presented in the teacher's manual was
97	94	a. Easy to understand
6	6	b. Difficult to understand
		10. Was the Test of Science Processes adjusted to a fifth grade level of comprehension?
0	0	a. Usually too simple
44	39	b. Usually fifth grade level
69	61	c. Usually too advanced

TABLE 2 (cont'd.)

N	%		
		11.	How would you assess your students' reactions to the test?
1	1		a. Very favorable
35	30		b. Favorable
54	48		c. Indifferent
16	14		d. Unfavorable
8	7		e. Very unfavorable
		12.	In evaluating your total impression of the televised Test of Science Processes, how would you grade it?
7	6		a. Excellent (A)
42	36		b. Good (B)
40	35		c. Fair (C)
19	16		d. Poor (D)
8	7		e. Bad (F)
		13.	Would you like to have your students take the Test of Science Processes again?
19	18		a. Yes, no matter how it is presented
37	35		b. Yes, especially if it is presented on television
21	20		c. Yes, but only if it is not presented on television
28	27		d. No

> Television tape was of poor audio-video quality...
>
> Sometimes complete picture could not be seen over the TV screen...
>
> Some of the picture questions had the most important parts cut off the bottom such as the scale of miles when they too use it for measuring.

Other teachers indicated that there were too many students for one monitor and those in the back could not distinguish relevant aspects of the video or that glare was a problem. The average class size according to the questionnaire was between 15 and 30. In a group of this size, to make the acute visual discrimination necessary, there should be two monitors.

The results of the survey demonstrated that the distribution of test materials had been successful in that over 90 percent of the teachers received the Teacher's Test Manual. This figure may have been even higher, but there seems to have been some confusion as to what the manual was as indicated by one teacher in a written comment.

> I am not sure that I had the use of a manual. I believe the test had a sheet of directions...

The information contained in the manual was generally well-received. Once again, the survey indicates that only three percent found the manual's orientation to the test inadequate, while 94 percent found the information it contained easy to understand.

An important concern with the teachers was the level of comprehension of the test. The majority of those responding (61 percent) felt that the TTSP was too advanced for fifth graders, especially those students with below-average reading skills.

These are some of their comments.

> It seemed to be too advanced for our fifth grade students. Many said they guessed in answering.

> I would like to have my class take the test at the end of their 5th grade year instead of the beginning of the year. A lot of the material presented on the test will not be covered until the end of the 5th grade year.

> Pupils of low level were having difficulty with coordination of looking at the TV and listening, then reading booklets and marking their answer. This type of test, I felt, was suited for one level.

The teachers also indicated that motivation was a problem for the student and in at least a few instances for the teachers, themselves. The responses to Question 11 show that 68 percent of the students, as judged by their teachers, reacted indifferently or unfavorably to the test. This may be due to the issues discussed above, poor reception and perceived test difficulty, but there seems to be two other factors which also enter into it as expressed by this teacher.

> In my opinion the test would have more validity... (a) do not tell the students the test is non-graded. I found several students responding without giving thought or consideration to the questions. (b) more time for teacher preparation. In other words, perhaps the day before testing.

Other teachers also mention these problems. One comment, in particular, was most revealing.

> I was not satisfied with the reason we gave the test. It has no introduction, little explanation, and seemingly no relevance for us...As I recall instructions to the teacher -- little help was given to motivate or explain the test.

Despite the reservations expressed above, the overall response to the TTSP by the teachers was favorable. In Question 12 of the

survey, they were asked to assign a letter grade to their overall experience with the TTSP. More than three-quarters of the teachers gave a passing grade, with 42 percent giving either an "A" or a "B". Also indicative of their positive response to the experience was that slightly less than three-quarters wanted their students to have the opportunity to take the test again, with 35 percent especially favoring the mode of television presentation.

Summary

The concern of this study has been the development of a procedural model for the administration of a visual test over broadcast television and the implementation of this model to the administration of the Television Test of Science Processes. Since a review of the literature yielded no useful guidelines, the problem was analyzed. This analysis produced a developmental model, which was then applied to the specifics of the TTSP. This resulted in a schema of procedures for each of the ten functions of the model. These procedures were then implemented, as discussed in this chapter, resulting in the administration of the TTSP to approximately 3500 fifth-grade students in fourteen school districts and five individual schools throughout central Pennsylvania, during the months of September and October of 1975.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Statement of the Problem

This study was concerned with an expansion of the applications of television to modern education. Specifically, it dealt with the use of broadcast television as a delivery medium for a visual test of achievement. The problem of the study was how a model for administering such a test over broadcast television could be developed and implemented.

Summary

The test that was the impetus for the study is the Television Test of Science Processes, a visual test of achievement for elementary school students. It was developed by David Torrence for "Science for the Seventies," a series of instructional units for elementary school level science, combining television demonstrations with integrated classroom activities. The TTSP had reached the point in its development where a large-scale exposure was needed to establish norms for target populations. As a result, the test was scheduled for broadcast over a public television station, as part of an in-school service program, in September of 1975.

Due to the innovative nature of this problem, a search of the literature was undertaken to determine if a previous study had established any guidelines which could be adapted for the TTSP administration. The literature reviewed produced several studies in

each of the three related areas of visual testing, test administration via television, and television testing. From these studies it was concluded that television testing could offer several advantages. Some of these were visualization, standardization, and cost-effectiveness. None of the studies dealt with testing situations of the scope of the upcoming broadcast of the TTSP, however, and therefore had not developed any applicable guidelines.

As a result, an analysis of the problem was undertaken. It was first divided into sub-problems for consideration. This resulted in the development of a model consisting of the three stages of identification of participants, distribution of test materials, and evaluation. The functions were identified for these stages. Taking each of these functions into consideration, specific sets of procedures were developed for the administration of the TTSP. These procedures were then implemented.

Presentation and Discussion of the Findings

The application of the specific procedures derived from the model resulted in the successful administration of the TTSP. Approximately 3500 students took the test and three-quarters of these took the test on the dates that it was broadcast. The remainder took the test by videotape at a later date. All procedures derived from the model worked acceptably; however, some difficulties were encountered. Each function of the model will now be reviewed in light of the experiences gained from this administration of the TTSP.

Stage I: Identification of Test Population

Function 1: Publicize Test and Function 2: Solicit Interested Institutions. Time limitations resulted in the combining of these functions. Both the letter written by the Executive Secretary of AEBC to the area school districts and the presentation to the district delegates at the AEBC Utilization Conference resulted in an ample test population; however, a wider publicity campaign would have probably resulted in an even larger audience.

Some problems were encountered at the conference presentation in that the presenter did not have sufficient knowledge of the developmental aspects of the TTSP and, thus, was unable to answer questions of this nature satisfactorily. It is suggested that future presentations of this type should include a person qualified to handle these questions. This would enable those teachers and administrators at the elementary school level to be more aware of the purpose and rationale of the test and, thus, be more fully supportive toward its upcoming administration.

Function 3: Identify Participating Institutions. For the administration of the TTSP, institutions that were going to participate were identified when they requested test materials. Some difficulties were encountered as a result of this and will be discussed in the review of the next function.

Stage II: Implementation of Logistical System

Function 4: Implement Materials Distribution System. Since no formal system was established for requesting participation in the

broadcast and test materials, most of the requests were received on an informal basis by AEBC and then forwarded to a member of the SFTS project who mailed the test materials. This informality and the forwarding through several people resulted in the delays mentioned in Chapter IV. Because of this, three improvements are recommended.

First, more time should be allowed for the schools to respond to the invitation to participate in the TTSP. Since they had a time span of less than one month to respond after the first letter, compounded with the staff limitations of these schools during the summer months, most requests were received either shortly before the closing date for requests or shortly after it. This did not facilitate distribution; but, fortunately, all requests were accommodated.

Second, requests for TTSP test materials should be made on some sort of a standard form. This form would indicate date of request, the number of test booklets, answer sheets and teacher's manuals required, and the correct address to which they should be sent. This would reduce greatly, if not eliminate, misinformation due to informality of requests, especially those by telephone.

Finally, these formalized requests should be returned to the party responsible for the distribution of test materials and should not be forwarded through any other agency. This should eliminate any delays between the reception of requests and the mailing of materials.

Another problem encountered in the materials distribution system was that several schools did not receive enough answer sheets. Extra

care should be taken and, if necessary, small over-estimations should be made to insure that this does not happen because the transfer of answers from a photocopy to an original answer sheet is a time-consuming process and introduces the possibility of errors in the process which would reduce the student's score.

Function 5: Verify Proctoring Procedures. A telephone call to give special instructions is not sufficient. These instructions should be typewritten, duplicated, and attached to the Teacher's Manual. A telephone check shortly before the test is of value, however, to insure that the test materials have been received and to answer any questions.

The post-test survey indicated that two more improvements could be made in this area. First, more care must be taken to insure that the teachers receive the test manual in time to read it thoroughly. It cannot be assumed that this will happen just by mailing the manuals to the district or school AEBC representative. This person must know that the materials are to be distributed immediately and follow-up checks should be made.

The second problem area lies in the fact that some of the teachers felt left out, in that they did not understand the "why" behind the TTSP. The test needs more than the paragraph or two introducing it in the current test manual. The early sections of the manual should be revised and expanded to a fuller explanation of the background of the TTSP, why and how it was developed, what the TTSP evaluates, the benefits of the testing experience, and how

it was developed, what the TTSP evaluates, the benefits of the testing experience, and how teachers and students can derive the most from this experience. A section could also be added on motivating the students to perform at a maximum on a non-graded test. In addition, there may be a need for some face-to-face meetings between teachers and the personnel behind the TTSP to provide the extra reinforcement of personal contact. The above steps are needed to produce a teacher who is enthusiastic about the prospect of helping to administer the TTSP in the classroom and whose attitude toward the test can do nothing less than to motivate students toward a maximum performance.

Function 6: Present Test. This is entirely under the control of the broadcasting station and the classroom teachers. Since the survey revealed that too many students viewed the test in unacceptable conditions, efforts should be made in future test administrations to make the teachers responsible for reporting and eliminating any reception problems before the test is broadcast, or at worst, before the actual test questions are presented.

Function 7: Collect Test Materials. Few difficulties in this function were experienced. Nearly all the participating school districts and individual schools were diligent and prompt in the return of materials. Some, however, were unsure of the procedures to be followed, even though they had received a telephone call giving these special instructions. Once again, this argues for the distribution of all proctoring procedures, including special instructions, in print form.

Stage III: Evaluation of Testing Procedures

Function 8: Acquire Test Results. The only difficulties encountered in this function resulted from the use of photocopied answer sheets which had to be recopied. Other than that, it was simply a process of sorting the answer sheets and bringing them to Examination Services of The Pennsylvania State University which performed the coding and scoring.

Function 9: Distribute Test Results with Interpretations. As mentioned in Chapter IV, David Torrence performed this function after gathering information on each school in regard to location, grouping of classes, and the type of science program in use. With this information and his extensive knowledge of the TTSP, he was able to provide the participants with the individual results and appropriate interpretations.

Function 10: Evaluate Test Administration. This was performed quite adequately by developing a survey questionnaire and distributing it to the teachers and administrators who participated in the experience. The provisions that were made for written responses proved to be very valuable, since many of these comments were particularly revealing. This feedback functioned as a source of constructive ideas for improving the administrative processes.

Conclusions

1. The first large-scale administration of the Television Test of Science Processes was a success. Approximately

3500 fifth-grade students in schools throughout central Pennsylvania were evaluated by the test. This provided Torrence with the necessary data for the establishment of norms for target populations.

2. Since this administration of the TTSP was successful, the procedural model that was developed and implemented for this purpose, which was the problem of this study, has been validated.
3. Since the worth of the model has been demonstrated, it should be implemented with the suggested revisions in the future administrations of the TTSP.
4. The model can also be considered as a prototype that is adaptable to the administrations of other tests when broadcast television is used as a delivery medium.

Guidelines for Implementing the Model

Since the worth of the model has been demonstrated in the successful administration of the Television Test of Science Processes over broadcast television, it is hoped that others in the fields of instructional technology and education will find it useful in future administrations of visual tests over broadcast television. This holds not only for future administrations of the TTSP, but also for other visual tests yet to be developed.

The first implementation of the model, which has been the subject of this study, has provided many experiences that have given

much insight into the administrative procedures involved. With these experiences in mind, the following guidelines are offered for the future implementation of the model. Once again, the model, itself, will be used as a framework for the discussion.

Stage I: Identification of Test Population

Function 1: Publicize Test. Every resource available may be used to generate publicity for the upcoming broadcast of the test. Among the possibilities are notices in newspapers and educational publications, promotional spots on educational radio and television, especially on the station that will be broadcasting the test, and presentations by the developers of the test at conferences, workshops, and schools that are potential participants.

Besides disseminating general information, such as the nature of the test and the date and time it will be broadcast, it is also important that determined efforts be made to insure that potential participants are also aware of the purpose and rationale of the test, so that they may be more supportive toward its upcoming administration.

Function 2: Solicit Interested Institutions. All forms of publicity generated in Function 1 can close with an invitation to write or call the test administrators for further information. This should be the main source of potential participants.

In conjunction with the above, those schools that the test administrators believe would be the most likely prospects should be

contacted formally by letter. Whenever possible, personal contact should also be made since it tends to provide the final impetus for participation.

Function 3: Identify Participating Institutions. Identifying the schools that will participate should be done formally, especially since requests for the necessary printed test materials is done at the same time. Sources of confusion can be eliminated by providing interested institutions with a standardized request form when they are solicited by letter. This request form would not only represent a commitment by the schools returning it, but also should contain an area for indicating the needed amount of test booklets, answer sheets, and teachers manuals. In addition, a closing date for requests should be established that allots adequate time for both the return of the request form and the distribution of the printed materials. All requests should be returned to the party responsible for materials distribution.

Stage II: Implementation of Logistical System

Function 4: Implement Materials Distribution System. Requests for the printed test materials should be processed as soon as possible after they are received. Any special instructions for the upcoming administration of the test should be printed and included with the teachers manual.

Function 5: Verify Proctoring Procedures. Approximately two weeks before the broadcast of the test, a telephone check should be

made with each participating school to insure that the printed materials have been received and to answer any questions about proctoring procedures. If circumstances and resources permit, there could be much benefit derived from a workshop held in each school by the test administrators for the classroom teachers that will be participating. This personal contact should insure that these teachers understand their role in the administration of the test and would provide an opportunity to encourage their enthusiasm and constructive criticism.

Function 6: Present Test. Responsibility for this function rests with the broadcasting station and the classroom teachers proctoring the test. It is vital to the success of the test administration that any problems of television reception in the classroom of the participating schools be identified and eliminated before the broadcast. Classroom teachers must be made aware of their role in reporting any difficulties in this area and school administrators should insure that these difficulties are resolved.

Function 7: Collect Test Materials. In the printed special instructions distributed with the teachers manuals, there should be a description of the procedures to be followed in labeling and returning the completed answer sheets and the other printed items. In most circumstances, they can be mailed back to the party responsible for their distribution. As part of these instructions, a closing date should be provided for the return of these materials and their prompt return should be encouraged.

Stage III: Evaluation of Testing Procedures

Function 8: Acquire Test Results. In the case of a large-scale administration, such as in this study, provisions should be made in advance for the machine scoring of the answer sheets. With the necessary arrangements made, the test results can be acquired quickly and easily.

Function 9: Distribute Test Results with Interpretations. Participating school should be provided with the scores of their own students that took the test with the appropriate interpretations. The distribution of these interpreted test results should be done with discretion and confidentiality. It cannot be overemphasized that the test participants must understand what the results mean and how these results can be properly applied.

Function 10: Evaluate Test Administration. A written survey, similar to the one developed for this administration of the Television Test of Science Processes, is a worthy tool for the assessment of the overall administration. The high return rate of the TTSP questionnaire demonstrates the positive response toward this device by teachers and administrators alike. The multiple-choice questions can provide revealing statistical data and, by encouraging the additional written responses, further insight is gained into the classroom administration of the test. The results of this survey can provide the necessary feedback for the improvement of both the test and the processes involved in its administration.

Recommendations for Further Study

Based on the results and the conclusions of this study, the following areas for further study and consideration are suggested:

1. Further implementations of the model should be performed in the administration of visual tests over broadcast television. This will serve to further validate and improve the model. In particular, the model should be implemented in the future administrations of the Television Test of Science Processes, since it was developed for this purpose.
2. The television Test of Science Processes should be readministered to the student population who were evaluated by it during the course of this study. This would provide valuable comparative data both on student performance and on the recommended suggestions for the model's refinement.
3. Research needs to be done on what are the best methods to improve the affective responses of the classroom teachers who proctor the TTSP. Preliminary efforts should involve the revision and expansion of the Teacher's Manual and, if possible, the implementation of in-service workshops for these teachers in the schools that are participating in future administrations.

4. Much study needs to be done on what is necessary to optimize the reception of television in classrooms. As this study has pointed out, too often the classroom television monitor is the limiting factor in this reception. The causes of poor classroom reception, be they human, mechanical, or electronic, need to be identified and solutions need to be proposed, implemented, and evaluated in order to correct this lingering problem.
5. Whether or not there is a significant difference in taking the TTSP in color or monochrome needs to be investigated. Question 3 of the survey showed that 90 percent of the classroom television monitors were monochrome, while the test was recorded in color. There may be no difference, since the test was designed with the knowledge that some groups would be viewing it in monochrome, but the size of this group demands that statistical tests be made to insure that there is no significant difference in the group means.
6. Further research and development should be done in the general field of visual testing, and in particular, in the use of broadcast television as a delivery means for this type of test. The results of this study have demonstrated that this technique is a promising tool of educational evaluation.

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APPENDIX A

TELEVISION TEST OF SCIENCE PROCESSES TEST BOOKLET

DO NOT TURN THE PAGE UNTIL THE TEACHER TELLS YOU TO DO SO

TELEVISION TEST

of

SCIENCE PROCESSES

INTRODUCTION

This test is different than many of the tests you take. It will involve what you see on the television screen. Choose your answers from among the choices given in this booklet. Mark your choice on the special answer sheet.

Below are two practice questions. These will help you to understand what you are to do. Wait for the television introduction before you begin.

109. Here are 5 pieces of paper. Which piece of paper is both black and square?

A. 1
B. 2
C. 3
D. 4
E. 5

110. Here is a baseball on a sloping board. When the ball is released, what direction will the ball go?

A. up the board
B. down the board
C. stay where it is released
D. will rise in the air
E. both A and B (meaning both up and down the board)

DO NOT TURN THE PAGE UNTIL THE TEACHER TELLS YOU TO DO SO

1. This is a picture of 5 pieces of paper. Which statement identifies all the differences?

   A. 4 is a different color
   B. 2 is smaller
   C. 2 is smaller than all the others and 4 is a different color
   D. 1, 3, 4, and 5 are the same size
   E. 4 and 2 are different from each other

2. This is a picture of 8 pieces of paper. If you group them by shape, what is the smallest number of groups you can make?

   A. 1
   B. 2
   C. 3
   D. 4
   E. 5

3. Here are 7 toy airplanes, Airplanes 1, 2, 4, and 6 make up a special group. What does this group include?

   A. The planes that are modern jets
   B. The planes that are not black and are modern jets
   C. The planes that are black
   D. The planes that are not black
   E. The planes that are gray and white old-time 2-wing airplanes

4. This is a picture of pieces of paper which were left in the sun for different numbers of days. Which is the only thing you can say for sure, based on what you see in the picture?

   A. Sample 1 faded more than sample 2
   B. All paper will continue to fade forever the longer they are left in the sun
   C. Any paper left in the sun will fade
   D. Both samples faded more by day 5 than it had by day 2
   E. Paper will fade in the sun, but cloth will not

5. This is a picture of 5 things. Which of them has volume?

   A. 1
   B. 2
   C. 3
   D. 4
   E. 5

6. There are two pots of water on a stove. Which choice is the best way of telling how they are different?

   A. The water is boiling in pot B
   B. The gas in on in pot B
   C. The water gets hot when the gas is on
   D. The water is not boiling in pot A
   E. The water is boiling in pot B, but it is not boiling in pot A

7. Here are 5 objects. Which of them is NOT in the same state of matter (solid, liquid, gas) as all the others?

   A. The pencil
   B. The water
   C. The toy whistle
   D. The ball
   E. The beads

8. This picture has 4 parts. Each part shows a compass, a bar magnet and a curved magnet. In which two parts are three things arranged in the same way?

   A. 1 and 3
   B. 2 and 4
   C. 1 and 4
   D. 2 and 3
   E. 1 and 2

9. Here are 5 objects. Which objects could serve as paper weights?

   A. 1, 3, 4 and 5
   B. 3 and 4
   C. 1, 2 and 5
   D. 2 and 5
   E. 2, 4, and 5

10. Here are 6 objects. Which objects can be used for carrying water?

    A. 1, 2, 3, 4 and 6
    B. 1, 2, 3, and 6
    C. 1, 2, 3, 4 and 5
    D. 1, 2, 5 and 6
    E. 1, 2, 3 and 5

11. Here are 10 marbles and 5 other objects. Which objects can be used to carry all 10 marbles at the same time?

    A. 1, 3 and 5
    B. 1 and 5

C. 1, 3 and 4
D. 1, 2 and 3
E. 2, 3, 4 and 5

12. Which temperature reading is 25 degrees lower than 15° Fahrenheit?

A. -10° Fahrenheit
B. 15° Fahrenheit
C. - 25° Fahrenheit
D. 0° Fahrenheit
E. 40° Fahrenheit

13. This is a chart of information about 5 planets. Which of these planets has the longest year?

A. Jupiter
B. Saturn
C. Mars
D. Mercury
E. Uranus

14. Look at the chart again. Which 2 planets have about the same length of day?

A. Jupiter and Saturn
B. Mars and Jupiter
C. Mars and Uranus
D. Mercury and Uranus
E. No two

15. This is a graph of the boiling temperatures of 6 different liquids. Which liquid has the lowest boiling temperature?

A. Liquid 1
B. Liquid 2
C. Liquid 3
D. Liquid 5
E. Liquid 6

16. Look at the graph again. Which liquids have the same boiling temperature?

A. 4 and 6
B. 3 and 4
C. 1 and 5
D. 1 and 2
E. 3 and 5

17. Here is a ball. Which of these would be best for measuring the distance around this ball?

    A. Tape measure
    B. Meter stick
    C. Yard stick
    D. 1-foot ruler
    E. 6-inch ruler

18. Here are 2 clocks. In picture A, it is 3:40 in the afternoon. In picture B it is 6:10 that evening. How much later was picture B taken?

    A. 2 hours and 30 minutes
    B. 6 hours and 10 minutes
    C. 3 hours and 40 minutes
    D. 9 hours and 50 minutes
    E. 9 hours and 30 minutes

19. Which unit is used in expressing area?

    A. Inch
    B. Cubic centimeter
    C. Yard
    D. Square yard
    E. Meter

20. Which unit is used in measuring weight?

    A. Gram
    B. Kilometer
    C. Cubic centimeter
    D. Centimeter
    E. Meter

DO NOT TURN THE PAGE UNTIL THE TEACHER TELLS YOU TO DO SO

TELEVISION TEST
of
SCIENCE PROCESSES

PART II

DO NOT TURN THE PAGE UNTIL THE TEACHER TELLS YOU TO DO SO

21. This is a picture of a box with its measurements shown on it. What is the area of the top of the box?

    A. 20 square inches
    B. 300 square inches
    C. 35 cubic inches
    D. 160 square inches
    E. 35 square inches

22. This is a marble and a ruler. If the marble rolls from point A to point B in 2 seconds at a steady speed, how fast is it going?

    A. 12 inches per 2 seconds
    B. 24 inches per second
    C. 2 feet per second
    D. 1/2 foot per second
    E. 1 foot per second

23. This is a picture of a box and 5 drawings. Which is the best drawing of the box?

    A. 1
    B. 2
    C. 3
    D. 4
    E. 5

24. Which unit is used in measuring length?

    A. Centimeter
    B. Gram
    C. Square yard
    D. Acre
    E. Quart

25. This is a map. How far is it from North Town to Birch Falls?

    A. 9 miles
    B. 18 miles
    C. 4 1/2 miles
    D. 27 miles
    E. 6 3/4 miles

26. Look at the map again. If you were using the same scale to draw another map, how far apart would you place two towns which are 5 miles from each other?

A. 10 inches
B. 2/5 inches
C. 5 inches
D. 15 inches
E. 1 foot

27. In which pair are the units closest in size?

A. Pound and kilometer
B. Yard and meter
C. Meter and mile
D. Gram and liter
E. Centimeter and foot

28. These are two ice cube trays. One is filled with very hot water and one with cold water. Many people say: "HOT WATER MAKES ICE CUBES QUICKER THAN COLD WATER." Plan an experiment to test this. Which choice would be the best statement for helping you?

A. The hotter the water you start with, the faster it will freeze into ice cubes.
B. Hot water freezes into ice cubes faster.
C. Hot water freezes at higher temperatures than cold water.
D. Hot water freezes into ice cubes faster because it turns on the refrigerator.
E. Hot water makes steam -- steam keeps the refrigerator going.

29. If you want to test the statement: "HOT WATER MAKES ICE CUBES QUICKER THAN COLD WATER," which factor is the only one you should allow to change during the experiment?

A. The temperature of the water you use
B. The amount of water in each tray
C. The position of the trays in the freezer
D. The refrigerator in which you put the trays
E. The kind of trays you use

30. This is a graph of the results of an experiment. 200 seeds that were 10 years old and 200 new seeds were planted in good soil and watered each day.

100 old seeds were put in a cool place
100 old seeds were put in a warm place
100 new seeds were put in a cool place
100 new seeds were put in a warm place

Five things which may affect the growth of the seeds are: water, heat, soil, age, and light. Which of these were tested?

A. Heat and age only
B. Soil, heat and light only
C. Heat, soil, age and light only
D. Water and soil only
E. Water and age only

31. Look at the graph again. Here are some things you can see on the graph:

1. 182 seeds sprouted
2. 200 seeds were 10 years old
3. 200 seeds were new
4. 200 seeds were kept warm
5. 200 seeds were kept cool

Which one happened because of all the others?

A. 1
B. 2
C. 3
D. 4
E. 5

32. Here are 5 containers which will be left out in a thunder storm. Which is the best container to use to find out how many inches of rain will fall?

A. 1
B. 2
C. 3
D. 4
E. 5

33. Here are 4 screws and 4 magnets. Which statement CANNOT be made just from looking at the picture?

A. Screws 2 and 3 have big heads
B. Screws 2 and 3 are sticking to their magnets
C. Some screws are made from a metal which is not magnetic
D. All the screws with big heads in this picture are sticking to their magnets
E. Screws 1 and 4 are not sticking to their magnets

34. Here is some string. The manufacturer claims it will hold at least 100 lbs. What is the best way to check this?

    A. Hang a weight of 75 pounds on the string, and keep adding 1-pound weights until it breaks.
    B. Hang a 100-pound weight on the string and see if it breaks.
    C. Let two 100-pound boys pull on each end of a piece of the string and see if it breaks.
    D. Hang 101 pounds on the string and see if it breaks.
    E. Double the string and hang 50 pounds from it and see if it breaks.

35. This is a chart of the change in length of a metal bar as it is heated. What is its length at 40° C.?

    A. 101 centimeters
    B. 101.5 centimeters
    C. 102 centimeters
    D. 102.5 centimeters
    E. 103 centimeters

36. Look at the chart again. What will the length of the bar probably be at 100° C.?

    A. 103.5 centimeters
    B. 104 centimeters
    C. 104.5 centimeters
    D. 105 centimeters
    E. 105.5 centimeters

37. What is the best way to check the answers to the last two questions?

    A. Measure the bar at 100° C. and then graph all the numbers to check your answers.
    B. Measure the bar at 120° C. and then make a graph of all the numbers to check your answers.
    C. Put all your answers on the chart and see if they look correct.
    D. Measure the bar at least 5 times at other temperatures and compare what you find with your answers.
    E. Measure the bar at 40° C. and at 100° C. and compare what you find with your answers.

38. These are 2 pictures of a battery, a bulb, a switch, and some wires. Which is the only thing you can be sure is different between the pictures?

A. The bulb was replaced for picture 2.
B. The wires were tightened for picture 2.
C. The bulb was screwed in for picture 2.
D. The battery was electrically recharged for picture 2.
E. Electricity is flowing through the bulb in picture 2.

39. If you want to prove that "NOT ALL THINGS GET BIGGER AS YOU HEAT THEM," what would you need to do?

A. Find one thing that does not get bigger when it is heated.
B. Find all the things that do not get bigger when they are heated.
C. Find one thing that gets bigger when it is heated.
D. Find all the things that get bigger when they are heated.
E. Find all the things that do not change size when they are heated.

40. If you want to make this statement: "THE COLDER A CITY IS, THE MORE SNOW IT HAS," what do you need to know about some cities?

A. The average temperature of each city and the number of snow plows each has
B. The number of days school was closed in each city because of snow
C. The average temperature and precipitation of each city
D. The average temperature and average snowfall of each city
E. The average number of times it snows in each city

APPENDIX B

TELEVISION TEST OF SCIENCE PROCESSES, TEACHER'S TEST MANUAL

TV TEST OF SCIENCE PROCESSES

TEACHER'S TEST MANUAL

Introduction

This test is a modification of Dr. Robert Sher Tannenbaum's Test of Science Processes. It has been adapted for television presentation for the intermediate grades in an effort to assess the scientific skills and abilities that are emphasized in many of the modern science programs. Dr. Tannenbaum defines processes and the function of the test as:

"Processes" are ways of doing things. For example, scientists have to be able to look at things very carefully and tell what they see. Scientists have to be able to measure and use numbers. And, scientists have to be able to plan and understand experiments. This is a test of how well students can do some of the things scientists have to do. It is NOT a test of how many facts they know about science.

Preparation

Allow sufficient time before the scheduled TV presentation to prepare the students for the TV test. Following the introduction to Part I of the test, there will be two practice questions to show your students the test format followed immediately by the test questions. Be sure your students have the necessary materials prior to the TV presentation. They should have a pencil, a piece of scratch paper for doing any computations, an answer sheet, and a test booklet. Additional pencils and scratch paper should be accessible to the students. DO NOT allow the students to open the test booklet prior to the TV presentation. DO NOT "prime" the students in any way through your knowledge of the test questions as this will negate the test results. To help you regulate the time and reduce the chance of a period of inactivity prior to the TV presentation, you can have students fill in the necessary student identification information on the answer sheet until the presentation begins, and complete the information after the presentation.

TV Presentation

Information regarding the time of the TV presentation of the Television Test of Science Processes will be given to you by your school district. The TV presentation will consist of two 30-minute programs given one week apart. Part I will include two practice

questions and questions assessing the processes of classifying, observing, comparing, and quantifying. Part II will not repeat any of the practice questions or directions, but will include questions assessing the processes of measuring, inferring, experimenting and predicting. The programs will present all the information necessary for the questions, including the visual presentation as well as the audio presentation of the narration given in the test booklet.

Test Booklet

Inform students that they should not write in the test booklets. The test booklets contain the test questions and answer choices that are contained in the narration of the TV presentation. While there is no visual information on which to base answers, it is imperative that the students should not review any of the test questions prior to the formal presentation. This additional "cue" factor could invalidate the test results by introducing a reactive effect of interaction effect.

Answer Sheet

The answer sheet that is supplied is a machine-scored type. Instruct the students in the correct way to mark answers. The following diagram shows the correct way to fill out the name block. Answer spaces 13, 14, 19 and 20 are done incorrectly as an example of common mistakes often encountered with those not instructed in the use of this type of answer sheet.

Be sure to tell your students to choose only one answer for each question and to fill in the answer space with dark marks. If a student should change an answer, remind him to erase his first mark completely. If he breaks a pencil, he is to hold up his hand and the teacher will give him a new one immediately.

(DIAGRAM OF ANSWER SHEET PRESENTED)

Procedure

There will be a single answer sheet for the two TV programs. Be sure to use a student identification number of identify the students. Collect the answer sheets and test booklets after each presentation and store in a safe place until they are requested.

APPENDIX C

LETTER FROM WILLIAM M. BARNHART, AEBC, TO SUPERINTENDENTS, MEMBER DISTRICTS OF AEBC, AND AEBC DISTRICT DESIGNATES, DATED AUGUST 14, 1975

William M. Barnhart
Executive Secretary

ALLEGHENY
EDUCATIONAL
BROADCAST
COUNCIL, INC.

444 E. College Avenue
State College, PA
(814) 865-3467

Date: August 14, 1975

To: Superintendents, Member Districts of AEBC
AEBC District Designates

From: William M. Barnhart

The Allegheny Educational Broadcast Council is consistently seeking new ways of incorporating television into the total instructional system and gathering evidence to determine its appropriate use in the classroom. An opportunity is now available to experiment through television, that we have not yet attempted, launching us on a long-range evaluation of the effectiveness of television as an instructional resource in our schools.

During the past few years, the Department of Education (PDE) has sponsored a concentrated thrust to use instructional television to assist elementary school teachers in the teaching of science. The materials and related television programs associated with this thrust, entitled SCIENCE FOR THE SEVENTIES (SFTS), are part of a comprehensive effort to assist school districts and individual teachers to improve their science instructional programs. These materials are designed to help teachers make a transition to a contemporary science instructional program or, if they are already involved in a modern program, to help them with instructional strategies and procedures that will increase their teaching effectiveness.

A Test of Science Processes for which reliability and validity has been established, and which can be administered through television, has been developed by the SFTS staff. This test is designed to be administered at about the fifth grade level in two half-hour television segments. All instructions are given during the television broadcast. The person monitoring the test need only distribute a test booklet, an answer sheet, and a #2 pencil, to the students, turn on the television, supervise the group for a half hour, and then collect the materials for both half-hour segments of the test.

The test is scheduled to be broadcast twice during the week of September 15, as follows:

Part I - 9:30 a.m., September 16
Part II - 9:30 a.m., September 17

Part I - 2:00 p.m., September 18
Part II - 2:00 p.m., September 19

If you wish to videotape the test and offer it another time, you are welcome to do so.

We perceive that this test offers us the opportunity to accomplish a number of things: (1) We can explore the feasibility of testing a large number of students over a large geographic area through television. (2) It provides an opportunity to gather some baseline data on how students are performing in this particular area of science learning early in the SFTS program. This data can be compared with data gathered in future years to determine if growth is taking place. (3) Data can be forwarded to you relative to the performance of your school district.

Of course, these test scores must be handled very confidentially. Therefore, all scores would remain anonymous in the final report. However, if a school district wants the composite scores and the general test norms, this information would be provided upon request by the Superintendent.

If you are interested in participating, please determine the number of fifth-grade students who will take the test and notify Bill Williams of this number by SEPTEMBER 8. The appropriate number of test booklets and answer sheets will be forwarded to you. Upon completion of the test, return the booklets and answer sheets to AEBC.

If you wish to participate in the testing program but are unable to meet the scheduled broadcast of the test, AEBC will accept tests for scoring until November 15.

Further questions about SCIENCE FOR THE SEVENTIES and the Test of Science Processes will be answered at the AEBC Utilization Conference on August 26, or you may contact Bill Williams at the AEBC office.

WMB/MMS

APPENDIX D

LETTER FROM DAVID TORRENCE, TEST DEVELOPER, TELEVISION TEST OF SCIENCE PROCESSES TO AREA TEST COORDINATORS, DATED DECEMBER 15, 1975

THE PENNSYLVANIA STATE UNIVERSITY
University Park, Pennsylvania 16802

COLLEGE OF EDUCATION
Division of Academic
Curriculum and
Instruction

December 15, 1975

Dear

Recently you exposed your 5th grade students to the Science for the Seventies' Television Test of Science Processes. We have tabulated the norms for an extensive sample (in excess of 4,000) throughout the State. In an effort to aid you in making appropriate interpretation and in aiding us to provide appropriate credit and to provide you additional interpretive service, I would appreciate your help in amassing additional information.

Would you please provide me with a brief (one or two paragraph) description of your school district. Please include a statement of whether you have grouped heterogeneously or homogeneously; if you describe your district as predominantly rural, suburban, or urban; if you ascribe to a modern science approach as opposed to a traditional approach; and any special characteristics of your district that should be noted. This information would be mutually beneficial.

I hope to finalize the test-norms document upon receipt of these descriptions from the various schools and will send you the results shortly. Also, I will avail myself to you and your colleagues on any manner relative to the test and its interpretation. Your cooperation in the endeavor is greatly appreciated.

Sincerely,

David R. Torrence
Test Developer
Television Test of
Science Processes

DRT/njf

cc: Bob Hill
Bill Williams
Paul Welliver

THE PENNSYLVANIA STATE UNIVERSITY

University Park, Pennsylvania 16802

COLLEGE OF EDUCATION
Division of Academic
Curriculum and
Instruction

Enclosed is the computer print-out of your district's scores on the Television Test of Science Processes and a summary of the Norming Data. I hope this information is beneficial to your total testing program.

I would like to thank you for participating in this worthwhile television resource. A goal of Science for the Seventies is to provide a wide variety of resources and techniques to instructors throughout the State. We believe that the Television Test of Science Processes is just one of the ways we can be of service to Pennsylvania's educators.

As a result of the teacher's survey which accompanied the Television Test of Science Processes, a great deal of inciting information was amassed. I would like to address several comments which were repetitive among the teacher's remarks.

One comment that was expressed several times was that the test material seemed too difficult for fifth grade students at the beginning of the school year. A study conducted earlier in 1975 suggests that the teachers' concerns are somewhat justified. While the present test results are valid, the study found a significant difference between the means of an experimental 5th grade group who took the test as the end of the fifth grade experience (April) and the means of the norming 5th grade group who took the test at the beginning of the fifth grade experience (September).

While alternate hypotheses may explain this, a plausible hypothesis is that significant changes in students' performance in process abilities, either learned or developed, take place as a result of the 5th grade experience This information may help to establish an

optimum time for a testing program based on local needs. Any comparison to this data to subsequent testing must be made in the same time frame. If your district has special needs relative to program timing, we would welcome your suggestions.

A second comment which was expressed by several teachers dealt with the readability of the question content. First was the suggestion that all answers be read aloud for non-readers, and second was that some answers and distracters were not comprehended by fifth graders. A pilot-study found that narrating the answers proved more confusing than not narrating the answers. For this reason, the verbal content was designed to be at the low third-grade level. The question content syntactically was found to be at the high second-grade reading level. One aspect of testing that is difficult to control and appears to be a reading problem in some areas is that of cultural bias. Question 10, for example, shows an array of objects which include the "object" struck in a badminton game. In several districts it was easily identified as a "shuttlecock." In many areas, it was recognized as a "badmitten birdie," while in many other areas, it was unrecognizable as any object within the student's experience. All test developers are faced with this problem. It is not a reading problem in the pure sense but its recognition is highly correlated with reading ability. The point-biserial correlation of this item, for example, suggests that this doesn't threaten the validity of the test results, although as a teacher I can empathize with the teachers' concerns.

Still another area of some concern is one over which we have no control. This concern is the viewing clarity and size of the television image. Let me assure you that all the items were engineered to maximize the video signal. The tapes used for the production were of broadcast quality and designed for optimum viewing transmission. Several comments concerned distortion, vignetting (the truncating of the visual), small size, etc. These problems rest at the receiver and not with the transmission. As this is a "television first" for many areas, these problems should be addressed to the media services of the district. As future televised resources become more numerous, teachers should work closely with their media coordinators to maximize this valuable aide. Any help I can offer to this end, I will gladly extend.

Overall, the test was well received as indicated by the survey. The information can be used with confidence. Additional data concerning the test will be discussed with interested parties to the extent confidentiality permits. I, again, thank you for participating in this effort, and hope to offer you continued service in this program.

Sincerely,

David R. Torrence
Test Coordinator

cc: Bob Hill
Bill Williams
Paul W. Welliver